# Grade 7: Critical Questions for Use with the Progressions Documents for the Mathematics K–12 Learning Standards

The Mathematics K–12 Learning Standards (formerly the Common Core State Standards, also referred to as "the Standards") were built on learning progressions, informed both by research on children's cognitive development and by the logical structure of mathematics. These progression documents describe the cognitive development and structure of mathematics in several important areas of the standards. These documents note key connections among standards, point out cognitive difficulties and pedagogical solutions, and give more detail on particularly knotty areas of the mathematics. These documents are intended to inform teacher preparation programs and professional development, curriculum organization, and textbook content. Thus, their audience includes teachers and anyone involved with schools, teacher education, test development, or curriculum development.

## Critical Questions

For each progression document, including the Front Matter document, OSPI staff have developed several critical questions to guide discussions as you read through the documents. This document focuses on progression documents relevant for grade 7. These questions are not meant to be a "scavenger hunt" of the document, but rather an opportunity to engage in deeper conversation and consideration of the ideas and thoughts presented in the document. We encourage educators to use these questions to guide department, PLC, or staff meeting engagement with and conversations about the Progressions Documents for the Mathematics K–12 Learning Standards. Feedback and clarifying questions on these critical questions are welcome; please send your thoughts to asi@k12.wa.us.

### Draft Front Matter

1. Why is each audience identified as an important audience for discussions on learning progressions and these progression documents?
2. How can focusing on a small collection of general mathematical properties help students gain a better understanding and facility with mathematics than a large collection of specialized procedures?
3. Since well documented progressions for all of K–12 mathematics do not exist, what process can educators use to inform a learning progression in content for which a progression document does not exist?
4. Why is the inclusion of the Standards for Mathematical Practice important to a learning progression?

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5. As the Standards call for educators to approach mathematical concepts differently than many adults experienced them when they were in school, parents and non-educator stakeholders in particular often question the need for and value in a different approach. How can educators communicate the importance of this new approach, including changes such as described in the *Reconceptualized topics; changed notation and terminology* section, to parents and non-educator stakeholders?

## Draft 6–8 Progression on Statistics and Probability

1. What are some best practices for building from students' understanding of univariate data to an understanding of bivariate data?
2. What learning opportunities can educators provide to students to ensure they understand both directions of the two-way connection between relative frequency and probability?
3. The focus of the statistics and probability progression has been on quantitative data. What considerations need to be addressed when transitioning to categorical data in grade 8?

## Draft 6–8 Progression on Expressions and Equations

1. How might you use the progression described in this document to address the common student difficulties identified on page 5? Are there other difficulties you commonly see when students start working more frequently with algebraic expressions and equations? How might you address those?
2. What benefits to student learning are there from moving students from arithmetic thinking and problem solving to algebraic thinking and problem solving?
3. How can students in grade 8 use the strategies of solving equations described in grades 6 and 7, as part of a progression of learning, to solve systems of equations?

## Draft 6–8 Progression on The Number System; High School, Number

1. What instructional opportunities and conceptual foundations should be provided to students to develop the described understanding of the mathematics behind the "invert-and-multiply" procedure to dividing fractions?
2. How can educators use more familiar properties on rational numbers (see the sidebar on page 3) to develop student understanding of the "new" property of $p + (-p) = 0$ that comes into play when negative numbers are introduced?
3. What sequence of instruction, using the properties of addition and multiplication, especially the distributive property, can educators use to help students develop a mathematical understanding of multiplication and division of rational numbers?
4. What foundational understanding of exponents and rational and irrational numbers, developed in grades 6 through 8, is necessary to develop the understanding of number systems described for high school

## Draft 6–7 Progression on Ratios and Proportional Relationships

1. How do educators ensure that students develop an understanding of ratios as different than fractions when both can be represented in the form $\frac{a}{b}$ ?

2. What are common pitfalls, and how can they be avoided and/or addressed, in developing student understanding of both additive and multiplicative structures inherent in proportional relationships?

3. What role does learning to solve proportions of the form $\frac{a}{b} = \frac{x}{c}$ have in students' understanding and use of equivalent ratios to solve proportional relationship problems?

4. What modifications to the way ratios, rates, and proportional relationships are currently taught need to occur to bring instruction in line with the framework, aligned to the Standards, described in the Appendix?